CRANE AMUSEMENT GAME

FIELD OF THE INVENTION

[0001] The present invention relates generally to amusement games, more particularly to crane type amusement games and, even more particularly in one embodiment, to an amusement game in which a player attempts to win prizes by placing one or more prizes/objects on a scale or similar device and wins one or more prizes when the weight of the prizes/objects fall within a predetermined range.

BACKGROUND OF THE INVENTION

[0002] Coin-operated crane type amusement games, in which a player pays money for the opportunity to control a crane (comprising a gantry assembly, crane assembly and claw assembly) to win toys, novelty items, trinkets, candy and other items are well known. At one time or another most of us have seen, or even played these games at nickelodeons, traveling carnivals, circuses, arcades, amusement parks, restaurants, movie theaters, game rooms, truck stops, bowling alleys, fairs or retail stores. Trying to win prizes from crane games is both fun and challenging. Unlike other redemption games, where one plays for tickets or prizes pre-selected by an arcade or game owner, crane games allow the player to select the prize to be sought. Crane games, then, provide entertainment to men, women and children alike.

[0003] A number of crane games are known in the marketplace, including the Plush Bus™, Sports Bus™, London Bus™, Chocolate Factory™ (the world's first crane/pusher candy bar dispensing game), Pinnacle™, Plush Palace™ (a double gantry/crane), Grab 'n Go™, and Carnival™ crane, all of which are manufactured and distributed by Innovative Concepts in Entertainment, Inc. (ICE), of Clarence, New York.

[0004] Various improvements have been made in crane games over the years. Cabinets are now made of metal, with epoxy-powder coatings (e.g., Plush Bus™) for protection and longer life. Some games (e.g., Pinnacle™) offer cabinets with beautiful

wood finishes. Improvements have been made in the claw structure and operation, and in gantry and claw positioning and control systems. Electronic sensors and switching mechanisms have replaced mechanical sensors. Perhaps the most exciting development in recent years was the combination of a crane and pusher game in the popular Chocolate Factory™ game. In this game, the first of its kind to dispense candy bars as prizes, a player operates a crane to pick up one or more candy bars, and then carefully places the bars on a platform. A "pusher" then pushes the candy bars along the platform, which fall off the end of the platform (hopefully) as prizes.

[0005] Another recent improvement in crane amusement games is a cylindrical crane game manufactured by ICE, which game is the subject of United States Design Patent Application Serial No. 29/153,090, filed November 9, 2001, for an invention entitled, "Cylindrical Crane Game", which application is incorporated herein by reference, and United States Patent Application Serial No. 10/037,324, filed November 9, 2001, for an invention entitled, "Cylindrical Crane Game". The game disclosed in these applications comprises a unique cylindrical (polar) coordinate system, and corresponding translational movement of the crane gantry, as well as a cylindrically shaped game housing.

[0006] Despite the number and variety of crane type amusement games which have been known in the marketplace over the years, to date no one has apparently invented or manufactured a crane game that enables a player to grab prizes in one or more attempts and place the prizes on a scale, winning the selected prizes if their combined weight is below a preset limit, but losing the selected prizes if a player is "too greedy" and attempts to win prizes that exceed the preset weight limit. Thus, a longfelt need has existed for a crane game where a player attempts to win one or more prizes that she places on a scale, but loses the sought after prizes if she fails to redeem them before exceeding a preset prize weight limit.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention broadly comprises an amusement game having a crane assembly operatively arranged for securing game prizes/objects arranged on a game platform, a scale for weighing game prizes/objects, and a means for dispensing game prizes to a player or returning game prizes/objects to the game platform based on the combined weight of the game prizes/objects.

[0008] A general object of the present invention is to provide an amusement game having a crane assembly for securing prizes/objects arranged on a platform.

[0009] Another object of the present invention is to provide an amusement game having a means for determining characteristics of prizes/objects moved to a platform.

[0010] A further object of the present invention is to provide an amusement game that awards prizes when the determined characteristics of prizes/objects moved a platform satisfy predetermined criteria.

[0011] Still another object of the present invention is to provide an amusement game that awards prizes when a player successfully transports one or more prizes/objects from a game platform of the game to a scale assembly, and the weight of the one or more prizes/objects is within a predetermined range.

[0012] These and other objects, features and advantages of the present invention will become apparent upon reading the following detailed description of the invention in view of the several drawing figures and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The invention will now be described in detail with reference to the appended drawings in which:

Figure 1 is a perspective view of the amusement game of the invention;

Figure 2 is a perspective view of the amusement game filled with game prizes/objects and the claw assembly in a lowered position;

Figure 3 is a perspective view of the game platform and scale assembly;

Figure 4 is a perspective view of the game platform and scale assembly showing game prizes/objects placed in the prize/object gate;

Figure 5 is a perspective view of the game platform and scale assembly showing leftward movement of the prize/object gate for awarding game prizes/objects;

Figure 6 is a perspective view of the and scale showing rightward movement of the prize/object gate for returning game prizes/objects to the game platform;

Figure 7 is a perspective view of the player controls, prize/object ejection door and coin mechanism holder;

Figure 8 is a fragmentary perspective view of the amusement game, showing the upper portion of the crane game comprising the gantry assembly, the crane assembly, and the claw assembly of the present invention;

Figure 9 is a fragmentary perspective view of the amusement game, showing the upper portion of the game and illustrating movement of the gantry assembly and the crane assembly;

Figure 10 is a side view of the claw assembly of the present invention in the open position;

Figure 11 is a side view of the claw assembly of the present invention in the closed position;

Figure 12 is a fragmentary view of the claw assembly of the present invention in the closed position, with a part cut away to show the solenoid of the claw assembly;

Figure 13 is a view of the claw assembly similar to that of Figure 12, except showing the claw assembly in an open position;

Figure 14 is a fragmentary perspective view of the crane assembly;

Figure 15 is a fragmentary perspective view of the gantry assembly;

Figure 16 is a top view of the scale assembly, prize/object delivery chute, and prize/object return chute;

Figure 17 is a rear view of the of the scale assembly showing means for laterally moving the prize/object gate;

Figure 18 is a side view of the scale assembly, with some internal components shown in phantom;

Figure 19a is a flow chart which illustrates operation of the game of the invention;

Figure 19b is a continuation of the flow chart of Figure 19a;

Figure 19c is continuation of the flow chart of Figure 19b;

Figure 20a is a flow chart of the tilt interrupt mechanism of the invention;

Figure 20b is a continuation of the flow chart of Figure 20a;

Figure 21 is a flow chart which illustrates operation of the scale of the invention;

Figure 22 is a side view of the scale assembly and needle indicator;

Figure 23 is a schematic diagram illustrating a plurality of inputs to the microprocessor of the invention;

Figure 24 is a schematic diagram of the power supply section of the electronic circuit of the invention;

Figure 25 is a schematic diagram of the power supply operational indicators of the electronic circuit of the invention;

Figure 26 is a schematic diagram illustrating data and chip selects for the microprocessor to the EPROMS of the electronic circuit;

Figure 27 is a schematic diagram illustrating the address connections between the microprocessor and the EPROMs of the electronic circuit;

Figure 28 is a schematic diagram illustrating the display outputs and diagnostic display of the electronic circuit, and ticket dispenser control;

Figure 29 is a schematic diagram of the left/right daughter board interface;

Figure 30 is a schematic diagram of the microprocessor reset, crystal and control;

Figure 31 is a schematic diagram of the claw control;

Figure 32 is a schematic diagram of the prize detector interface to the main board;

Figure 33 is a schematic diagram of the audio amplifier;

Figure 34 is a schematic diagram of the front/back daughter board interface;

Figure 35 is a schematic diagram of the up/down daughter board interface;

Figure 36 is a schematic diagram of the high current light control;

Figure 37 is a schematic diagram of the nonvolatile memory;

Figure 38 is a schematic diagram of the limit switch input circuits for the gantry, crane and claw assemblies as well as the "take win" button input;

Figure 39 is a schematic diagram of the counters and lockout control;

Figure 40 is a schematic diagram of the power and ground connections for the integrated circuit chips on the main board;

Figure 41 is a schematic diagram illustrating the right half of the H-bridge driver controller board;

Figure 42 is a schematic diagram illustrating the left half of the H-bridge driver controller board and connection for same;

Figure 43 is a schematic diagram illustrating the credits display and connection;

Figure 44 is a schematic diagram illustrating the time display and connection;

Figure 45 is a schematic diagram illustrating the prize detector board.

Figure 46 is a schematic diagram illustrating the connections of the load cell A/D converter to the microprocessor;

Figure 47 is a schematic diagram illustrating the between the communications connector and the microprocessor and the needle indicator motor;

Figure 48 is a schematic diagram illustrating the processor and the motor positional inputs for the prize/object gate and the needle indicator;

Figure 49 is a schematic diagram illustrating the regulator and range light display connector; and,

Figure 50 is a schematic diagram illustrating the H-bridge motor control for the object/prize gate.

DETAILED DESCRIPTION OF THE INVENTION

[0014] In the detailed description that follows, identical reference numbers on different drawing views are intended to represent identical structural elements of the invention. The term "front" refers to the side of the game where the player controls are located, and the "rear" refers to the side of the game directly opposite the player controls (where the scale assembly is generally located). The terms "frontward" and "rearward" when used to describe movement of the gantry assembly, the crane assembly, the claw assembly and joystick, refer to movement toward the "front" and "rear" of the game, respectively.

[0015] The term "lateral" when used to describe movement of the crane and claw assemblies, or the prize gate, refers to movement to the "left" or to the "right" in relation to a player facing the player controls. The terms "up" and "down" refer to movement of the claw assembly direction toward and away from the crane assembly, respectively.

[0016] For purposes of illustration, the "Home" position of the gantry assembly, crane and claw assemblies, refers to the position of the gantry assembly, crane and claw assemblies before and after insertion of a coin or game credit. The "Home" position is generally shown in Figures 1 and 8 and refers to the "rearward" position of the gantry assembly, the laterally centered position of the crane assembly over the prize/object gate and scale assembly, and the claw assembly in the raised position.

[0017] It should be appreciated that the term "scale assembly" can be used to refer to the components generally comprising the scale, which include but are not limited to: the

scale, the scale plate, the load cell, the prize/object gate, the needle indicator and any electronic or mechanical components associated therewith.

[0018] The amusement game of the present invention generally comprises a game cabinet enclosing a gantry assembly, a crane assembly, a claw assembly, a scale assembly, and game prizes/objects arranged on a game platform. Using the player controls, the primary object of the game is to maneuver the gantry assembly and the crane assembly such that the claw assembly is positioned over game prizes/objects, lower the claw assembly to secure an amount of prizes/objects, raise the claw assembly, and then release the prizes/objects onto the scale assembly for weighing. The game prizes/objects are then weighed by the scale assembly, which is calibrated to determine whether the weight of game prizes/objects falls within a predetermined range. As shown in Figure 6, if the game prizes/objects weigh more than a maximum setting, the player loses the game and the game prizes/objects are returned to the platform. However, if the weight of the prizes/objects falls within a predetermined range, as shown in Figure 4, the player has the choice of either continuing play (and adding more prizes/objects to the scale assembly) or ending play to collect the prizes/objects placed on the scale plate, as shown in Figure 5. If the weight of the prizes/objects is less than the minimum setting, play continues and the player may add more prizes/objects to the scale assembly.

[0019] It should be appreciated by those having ordinary skill in the art that although the amusement game of the present invention comprises a gantry, crane, and claw means operatively arranged for movement within a polygonally shaped cabinet, other cabinet shapes (cylindrical, arcuate) and means for moving the gantry assembly, the crane assembly, and the claw assemblies are contemplated by the present invention, which shapes and means do not depart from the spirit and scope of the present invention.

[0020] It should also be appreciated by those having ordinary skill in the art that although the amusement game of the present invention comprises a "claw assembly" as having "scoops" for grasping game prizes/objects, the term "claw assembly" is meant to

include any type of assembly that can be used to grasp game prizes/objects, which include but are not limited to: hooks, magnetic assemblies, vacuum assemblies, hook and loop fastener assemblies, and other types of gripping, grabbing, or adhesive mechanisms.

[0021] It should be further appreciated by those having ordinary skill in the art that although the amusement game of the present invention comprises gantry and crane assemblies having wheels, worms, pulleys and gears operatively arranged for movement upon parallel rails, other means (which means include but are not limited to: monorail means, belt means, chain means or magnetic means) for moving the gantry and crane assemblies are contemplated by the present invention, which means do not depart from the spirit and scope of the present invention.

[0022] It should also be appreciated that the term "crane" as used herein can be used to describe both a "crane", which generally comprises a gantry assembly, a crane assembly, and a claw assembly, as well as a "crane", which comprises crane assembly 19 as described *infra*.

[0023] It should also be appreciated that the game of the invention can be configured to permit a single operation of the claw, i.e., permit a single opportunity to select a prize/object with the hope that the selected prize/object(s) will fall within the predetermined target weight, or may permit multiple operations of the claw whereby prizes may be accumulated.

[0024] It should also be appreciated that while the scale assembly of the preferred embodiment comprises a analog readout (needle indicator), the present invention could be easily configured to comprise a scale assembly having a digital readout.

[0025] Finally, while a preferred embodiment comprises an amusement game wherein a player places one or more prizes/objects on a scale for weighing to try to win those prizes/objects, it should be appreciated that the amusement game of the present invention can be configured to award prizes other than the prizes/objects placed on the scale, for example, redemption tickets, game credits or other prizes can be awarded regardless of

whether a player is successful or unsuccessful. In addition, although in a preferred embodiment the amusement game is configured to measure the weight of prizes/objects placed on a scale, it should be appreciated that the present invention can be configured to measure and determine other characteristics of the prizes/objects, such as size, shape, color, electrical, magnetic, and/or other visual properties, which configurations do not depart from the spirit and scope of the invention.

Structure of Apparatus of the Invention

[0026] The general structural elements of the present invention, which enable one having ordinary skill in the art to make the invention, will now be described in detail.

General

[0027] General structures of the combination amusement game are best understood by reference to Figures 1-2, which are perspective views of amusement game **10**. Adverting now to Figures 1-3, in a preferred embodiment, amusement game **10** generally comprises cabinet **11,** prize/object ejection door **13**, coin mechanism holder **14** (including a dollar bill validator) and player control panel **15**. Cabinet **11** generally encloses scale assembly **12**, needle indicator assembly **17**, game platform **18**, crane assembly **19**, claw assembly **20**, scale plate **21**, and game prizes/objects **22**. Cabinet **11** comprises front panel **37**. Adverting now to Figure 7, control panel **15**, coin mechanism holder **14** and prize/object ejection door **13** are mounted to front panel **37**. Control panel **15** includes joystick **16**, "take win" button **36**, and player displays **38**. Joystick **16** further comprises down button **35**, which is used to lower the claw assembly. Coin mechanism holder **14** generally comprises coin slot **39**, for inserting coins, coin return **40**, and dollar bill validator (not shown), for accepting paper money.

The Gantry Assembly

[0028] Adverting to Figure 8, gantry assembly **41** and crane assembly **19** are operatively arranged to move and position claw assembly **20** for securing game prizes/objects on game platform **18**. Gantry assembly **41** generally comprises endplates

45a and **45b** for securing parallel rails **50a** and **50b**. The gantry assembly further comprises "frontward" and "rearward" (F/R) motor assembly **43**, which is operatively arranged for attachment to endplate **45a** and drive shaft **47** for providing front and rear movement to gantry assembly **41**. Gantry assembly **41** also comprises F/R wheels **49a**, **49b**, **49c** (not shown) and **49d** (not shown). Power and communications are provided to F/R motor assembly **43** by means of F/R power and communications cable **44**. Similarly, power and communications are provided to crane assembly **19** by means of crane power and communications cable **51**. The gantry assembly moves "frontward" and "rearward" about cabinet **11** along parallel rails **46a** and **46b** by means of F/R wheels **49a**, **49b**, **49c** (not shown) and **49d** (not shown). Parallel rails **46a** and **46b** are operatively arranged for supporting the gantry assembly and are secured to cabinet top **37** by means of supports/stops **48a**, **48b**, **48c**, and **48d**. Crane **19** is operatively arranged on rails **50a** and **50b** of gantry assembly **41** for lateral movement within cabinet **11**.

[0029] As shown in Figure 15, which is a detailed fragmentary view of F/R motor assembly **43** secured to endplate **45a**, F/R motor assembly additionally comprises electric F/R motor **71** for turning F/R worm gear drive **72**. Turning of F/R worm gear drive **72** in either a clockwise or counter-clockwise direction rotates F/R drive gear **73** to cause frontward or rearward rotation of drive shaft **47**. Frontward or rearward rotation of drive shaft **47** rotates F/R wheels **49b** and **49d** (not shown), which ride along rails **46a** and **46b** to cause frontward or rearward movement of gantry assembly **41**. As shown in Figure 15, support/stop block **48c** is provided for securing rail **46a** as well as for stopping frontward movement of gantry assembly **41**.

The Crane

[0030] Vertical and lateral movements of the claw assembly are generally provided by means of the crane assembly. Adverting now to Figure 14, crane assembly **19** comprises lateral motor **66**, which is secured by appropriate means to the crane assembly housing. Lateral motor **66** is operatively arranged to turn lateral worm gear drive **69**, which is

operatively arranged to rotate lateral drive gear **70**. Lateral drive gear **70** is secured to lateral drive wheel **68**, which, in turn, is left/rightly secured to the crane assembly housing. The above described elements of the crane assembly are operatively arranged to provide lateral movement of the crane.

[0031] As shown in Figure 14, rotation of lateral worm gear drive **69** causes the left/right movement of lateral drive gear **70**. Rotation of lateral drive gear **70** transfers left/right movement to lateral drive wheel **68** and causes crane assembly **19** to move along parallel rails **50a** and **50b**.

[0032] Crane assembly **19** further comprises up/down (U/D) motor **63** for providing vertical movement of claw assembly **20** via U/D cable **60**. As shown in Figure 14, U/D motor **63** is secured by appropriate means to the crane assembly housing and is operatively arranged for turning U/D worm gear drive **64**. Turning of U/D worm gear drive **64** transfers left/right movement to U/D pulley **65**, which is secured to the crane assembly housing by appropriate means such that it is operatively arranged for left/right movement to wind or unwind U/D cable **60** for raising or lowering claw assembly **20**.

The Claw

[0033] Figures 10-13 show side and fragmentary views of claw assembly **20** of the preferred embodiment. As shown in Figures 10-13, the claw assembly of the present invention generally comprises U/D cable **60**, claw power and communications cable **42**, coil cap **59**, coil housing **58**, claw interconnect holder **57**, a plurality of claw interconnects **54a-c**, plunger **55**, ballast **61**, claw "scoops" **52a-c**, claw tines **53a-c**, respectively, and claw connector **56**.

[0034] As shown in Figures 12-13, coil housing **58** and coil cap **59** are operatively arranged for encasing coil **62**, which receives electronic communications and power from claw power and communications cable **42**. Attached to coil cap **59** is U/D cable **60**. Claw interconnect holder **57** is adjustably secured on the outer surface of coil housing **58**. Claw interconnect holder **57** loosely secures a plurality of claw interconnects **54a-c**. Claw

interconnects **54a-c** are operatively arranged for attachment to claw interconnect holder **57** as well as to claw tines **53a-c**. Plunger **55** is operatively arranged for slidable movement within coil **62**. Plunger **55** is also secured to claw connector **56** by appropriate means. Ballast **61** is provided to assist claw scoop **52a-c** reopening. Claw tines **53a-c** attach to claw connector **56** at their distal ends. Attached to claw tines **53a-c** are claw scoops **52a-c** for grabbing prizes/objects. The attachment of claw scoops **52a-c** and claw tines **53a-c** to claw connector **56** and claw interconnect holder **57** via claw interconnects **54a-c** form a structure capable of opening and closing under electromagnetic and opposing weight forces.

The Scale Assembly

[0035] As shown in Figures 3-6, 16-18 and 22, the components of scale assembly **12** generally comprise prizes/object delivery chute **23** for dispensing prizes/objects to a player, prizes/object gate **24** for collecting an amount of prizes/objects for weighing on scale plate **21**, scale display **25** for determining the actual weight of game prizes/objects, scale data input and calibration means **26** for pre-programming and calibrating scale assembly **91** (shown in Figure 18), and prizes/objects return chute **28** for returning game prizes/objects to the game platform in the event a player overloads the scale plate with game prizes/objects and "Tips the Scales".

[0036] As shown in Figures 3-6, scale assembly **12** additionally comprises needle indicator means **17**, which is used for determining whether play may continue based upon the location of needle **29** in minimum range area **30**, collection range area **31**, or overload range area **32**. Needle **29** is passed through the various ranges by means of needle motor **27** (Shown in Figure 22). Needle indicator means **17** also comprises range light displays **33**.

[0037] Internal components of scale assembly **12** are best viewed with reference to Figures 16-18 and 22. As shown in Figures 16-18, prizes/objects gate **24** is operatively arranged for lateral movement such that prizes/objects can be awarded to a player or

returned to the game platform. Lateral movement of prizes/objects gate **24** is accomplished by a series of pulleys, belts, supports and shafts that ultimately transfer movement from prizes/objects gate motor **88**.

[0038] As shown in more detail in Figure 17, the internal components scale assembly **12** generally comprise prizes/objects gate motor **88** for providing left/right movement to attached drive pulley **89a**, which rotates drive belt **90**. Drive belt **90** is operatively arranged to engage belt pulley **89b**, such that belt pulley **89b** is rotated. Rotation of belt pulley **89b** rotates cable pulley **80a**, which is operatively arranged to engage and provide lateral movement to drive cable **82** about pulleys **80a** and **80b**. Lateral movement of drive cable **82** is transferred to cable support/switch activator **81**, bearing block support **86**, support bracket **74**, and prizes/object gate **24**. Bearing block support **86** is provided with bearing blocks **75a** and **75b** for slidable movement upon shafts **76a** and **76b**, which provide support for easing the lateral movement of prizes/objects gate **24**. Shafts **76a** and **76b** are secured to cabinet **11** by means of shaft support blocks **78a** and **78b**. Left and right stop blocks **79a** and **79b** are provided for limiting the lateral movement of prizes/objects gate **24**. Right, center and left limit switches, **83**, **84** and **85**, respectively, are provided for contacting cable support/switch activator **81** such that the prizes/objects gate maintains proper orientation and positioning.

[0039] As shown in Figures 18 and 22, the internal components of scale additionally comprises scale **91** for weighing the game prizes/objects and needle motor **27** for passing needle **29** through the "continue", "take win or continue" and "overload" ranges. Scale assembly **12** additionally comprises load cell **93** and needle servo-motor **27**. Game electronics are generally controlled by game electronics controller board **92** and other sub-electronics boards (not shown), which communicate with the main board.

Mechanical Operation

[0040] The frontward, rearward, lateral and vertical movement of the gantry assembly, the crane assembly, the prizes/object gate, and the claw assembly will now be more fully explained to enable a person having ordinary skill in the art to use the invention.

[0041] For purposes of illustration, movement of the gantry assembly and the crane and claw assemblies under direction of a player will be described with reference to the "Home" position which is generally shown in Figures 1, 3 and 8. As shown in Figures 1, 3 and 8, the "Home" position is generally defined as that position wherein the gantry assembly is to the rear, the crane assembly is laterally centered within the cabinet above scale plate **21** and prizes/objects gate **24**, and the claw assembly is in the raised position. In the "Home" position" the joystick is generally centered. "Left" or "right" movement refers to movement of the joystick, and crane and claw assemblies as would appear to an individual standing at the player controls and looking toward the rear of the game. "Frontward" and "rearward" movement refers to movement of the joystick and gantry assembly toward the front and rear of the game, where the "front" of the machine is that side defined by the player controls.

[0042] Adverting now to Figure 7, which shows a detailed view of player control panel **15**. Frontward, rearward, lateral and vertical control of the gantry, crane and claw assemblies of the combination amusement game are generally provided by player control panel **15**. As shown in Figure 7, player control panel **15** generally comprises joystick **16**, down button **35**, player displays **38**, and "take win" button **36** for receiving prizes/objects placed on scale plate **21**.

Frontward/Rearward Movement of the Gantry Assembly

[0043] Adverting now to Figures 8, 9 and 15. Front and rear movement of the gantry assembly is accomplished by moving joystick **16** toward the front and rear of the cabinet, respectively. Movement of joystick **16** in either the front or rear direction signals F/R motor **71** to turn F/R worm gear drive **72**, which is operatively arranged to engage F/R

drive gear **73** for turning drive shaft **47** and wheels **49b** and **49d** (not shown), which move along rails **46a** and **46b**. As shown in Figures 8 and 9, from the "Home" position, movement of joystick **16** toward the front of the machine causes gantry assembly **41** to move in a direction toward the player. Similarly, movement of the joystick toward the rear of the cabinet causes movement of the gantry assembly toward the rear of the cabinet.

Lateral Movement of the Crane Assembly

[0044] Lateral movement of the crane assembly is best understood by reference to Figures 8, 9 and 14. Figures 8 and 9 illustrate movement of the crane assembly is accomplished by moving joystick **16** toward the left or right of the cabinet. As shown in Figure 9, movement of the joystick toward the left has caused leftward movement of the crane and claw assemblies. Referring now to Figure 14; movement of the joystick to the left or right signals lateral motor **66** to turn lateral worm gear drive **69**, which is operatively arranged to engage lateral drive gear **70**, causing lateral drive wheel **68** to rotate in a counterclockwise or clockwise direction. As a result, the rotation of drive wheel **68** causes the crane assembly to move to the left or right within the cabinet along rails **50a** and **50b** of gantry assembly **41**. It should be appreciated that although they are not shown, crane assembly **19** comprises additional wheels for supporting the crane assembly on rails **50a** and **50b**.

Vertical Movement of the Claw Assembly

[0045] Vertical movement of the claw assembly is both automatic and provided under the direction of a game player. Vertical movement of the claw assembly is best viewed by reference to Figures 2, 8 and 14. As shown in Figure 2, lowering of the claw assembly is provided by a game player via pressing down button **35** of joystick **16** in the direction of the arrow. As shown in Figures 1,2 and 14, from the raised claw assembly **20** position, pressing down button **35** signals U/D motor **63** to turn U/D worm gear drive **64**. U/D worm gear drive **64** is operatively arranged for engaging and turning U/D drive pulley **65**, which unwinds U/D cable **60** to lower the claw assembly. After pressing U/D button **35**,

the claw assembly continues to lower until slack is formed in U/D cable **60**. When slack in U/D cable **60** is formed (as occurs when the claw assembly contacts game prizes or the game platform), the U/D motor **63** is signaled to stop and the claw assembly is signaled to contract in an attempt to grab prizes/objects. A short time period after contraction of the claw assembly (.5 seconds), U/D motor **63** is automatically signaled to raise the claw assembly, which causes U/D **63** motor to reverse such that U/D worm gear drive **64** rotates U/D drive pulley **65** to cause winding of U/D cable **60** for raising the claw assembly. As shown in Figure 3, once fully raised, the claw assembly then automatically returns to the "Home" position to drop any secured prizes/objects into the prizes/object gate and onto scale plate **21** for weighing.

Claw Operation

[0046] Referring now to Figures 10-13, which shows side views of the claw assembly of the present invention. As shown in Figures 11 and 12, when a current is passed through coil **62** proximate ballast **61**, an electromagnet is created, which attracts plunger **55**. The attraction of plunger **55** causes attached claw connector **56** to move along with the plunger **55** toward the coil. Movement of the claw connector in direction of the plunger acts upon the claw interconnects and the claw tines, such that contraction of the claw tines and the claw scoops occurs. Contraction of the claw tines and the claw scoops provides means by which prizes/objects may be secured as shown in Figure 3.

[0047] As shown in Figures 10 and 13, when current has ceased to pass through the coil, the magnetic effect upon plunger **55** is ceased and the plunger allowed to relax. The plunger, claw tines **53a-c** and claw scoops **52a-c**, thus return to the rest position under their own weight and open the claw assembly.

[0048] As shown in Figures 3-6, after being signaled to ascend and after the claw assembly has reached the "Home" position above the scale plate, the claw assembly is signaled to open such that any secured prizes/objects are allowed to fall into the prizes/object gate and onto scale plate **21** for weighing.

Scale and Prize/Object Gate Operation

[0049] The scale assembly, the scale plate, and the prizes/objects gate generally weigh, dispense and return game prizes/objects. As previously indicated, the object of the amusement game is to place an amount of prizes/objects greater than a predetermined minimum, but less than a predetermined maximum, onto the scale plate such that a player is awarded the game prizes/objects or other prize. If a player places prizes/objects on the plate which exceed the predetermined maximum, the player loses!

[0050] As shown in Figures 3-6, 18 and 22, weighing of game prizes/objects **22** is conducted by placing the game prizes/objects on scale plate **21**. The scale plate is operatively arranged to transfer the weight of the game prizes/objects to scale **91** and to a lesser extent, changes in weight to load cell **93**, after which needle motor **27** is signaled to cause needle indicator **29** movement.

[0051] As shown in Figure 3, before prizes/objects are placed onto the scale plate for weighing, needle indicator **29** remains in the "continue to add" range **30** of needle indicator assembly **17**. However, when a sufficient amount of game prizes/objects **22** are placed on the scale plate (between the minimum and maximum settings), needle motor **27** is signaled to move needle indicator **29** into the "take win or continue" range **31**. When the needle indicator passes into this range, light display **33** is illuminated. Additionally, when the needle indicator enters this range, a player is tasked to choose between continuing play (and adding more prizes/objects to the scale plate) or pressing the "take win" button. As shown in Figure 5, pressing the "take win" button causes the prizes/object gate to move toward the left such that the game prizes/objects are moved over prizes/object delivery chute **23**, which causes game prizes/objects **22** to be dispensed to the game player via prizes/objects ejection door **13**. Alternatively, as shown in Figure 6, if the weight of the game prizes/objects is greater than the maximum setting such that the needle indicator passes into the "overload" range **32**, the prizes/objects gate is signaled

to move to the right and game prizes/objects **22** are returned to the game platform via prizes/objects return chute **28**.

[0052] Lateral (right and left) movement of the prizes/objects gate **24** is best understood with reference to Figures 16-18. As shown in Figures 16-18, prizes/objects gate **24** is operatively arranged for lateral movement such that prizes/objects can be awarded or returned to the game platform. Lateral movement of prizes/objects gate **24** is accomplished by a series of cables, pulleys, supports and shafts that ultimately transfer movement from prizes/objects gate motor **88**. As shown in more detail in Figure 17, prizes/objects gate motor **88** is operatively arranged for providing rotation to attached drive pulley **89a**, which rotates drive belt **90**. Rotation of drive belt **90** engages belt pulley **89b**, such that rotation of belt pulley **89b** is caused. Rotation of belt pulley **89b** causes rotation of cable pulley **80a**, which is operatively arranged to engage and provide lateral movement to drive cable **82** about pulleys **80a** and **80b**. Lateral movement of drive cable **82** causes lateral movement of cable support/switch activator **81**, which is attached thereto. Movement of cable support/switch activator **81** causes movement of attached bearing block support **86**. Movement of bearing block support **86**, thus, causes movement of attached support bracket **74**, which causes lateral movement of attached prizes/object gate **24**. Bearing block support **86** is provided with bearing blocks **75a** and **75b** for slidable movement upon shafts **76a** and **76b**, which provide support for easing the lateral movement of prizes/objects gate **24**. Shafts **76a** and **76b** are secured to cabinet **11** by means of shaft support blocks **78a** and **78b**. Left and right stop blocks **79a** and **79b** are provided for limiting the lateral movement of prizes/objects gate **24**. Right, center and left limit switches, **83**, **84** and **85**, respectively, are provided for contacting cable support/switch activator **81** such that the prizes/objects gate maintains proper orientation and positioning.

Electronic Circuit Diagram

[0053] The general electronic control circuits **92** which control the electromechanical devices of the invention, via leads and cables (not shown), are illustrated in Figures 23-50. The game is microprocessor controlled, and, in a preferred embodiment, microprocessor U2 is Hitachi model H8S/2390, or equivalent. Sections of the microprocessor U2 appear in various circuit figures. The code for the microprocessor is stored in EPROMS U5 and U6 (shown in Figures 26 and 27), which, in a preferred embodiment are both EPROM model 27CO80. Latches U20 and U21 (model 74HC273, or equivalent), shown in Figure 28, ensure proper communication of the output signals to external devices, as is well known in the art. (A latch is a type of flip-flop that accommodates the settling of data received from the microprocessor.)

[0054] Power supply section **210** of the circuit broadly comprises four bridge rectifier circuits and a plurality of voltage regulators as described below. Alternating current at 120V is reduced by a multi-tap transformer (not shown) to a plurality of outputs at various voltage levels (36, 16.5, 13.2 and 10.5 VAC) which enter the main circuit board at connector P10. This AC supply voltage is provided via fusible links to a plurality of bridge rectifiers to produce pulsed DC voltages at a plurality of different DC voltage levels: namely, a 16V unregulated source provided by bridge rectifier DB1; a 36V regulated source provided by bridge rectifier DB2 and voltage regulator VR3; a regulated 12V source provided by bridge rectifier DB3 and voltage regulator VR1; a regulated 5V source provided by bridge rectifier DB3, voltage regulator VR1, and voltage regulator VR2; and a 12V unregulated source provided by bridge rectifier DB4. Each bridge rectifier includes a corresponding capacitor to filter and smooth the voltage waveform, as is well known in the art. In a preferred embodiment, voltage regulators VR1 and VR3 are high output model LM338K ICs, VR2 is a model LM7805. Associated with the power supply are LED indicators D1, D2, D3 and D4, shown in Figure 25, operatively arranged to indicate

status (operation) of the above-described power supplies of the circuit. (For example, D4 is operatively arranged to indicate the status of the 12V unregulated power supply.

[0055] The audio output section **220** of the circuit, illustrated in Figure 33, broadly comprises all of the circuit elements shown in Figure 33. Digital audio signals are initially stored in EPROMS U5 and/or U6 (shown in Figures 26 and 27). The audio signals include representations of various sounds used throughout play of the game, such as, but not limited to: background sound, sounds made when a coin is inserted, when a prize is won, when a prize is lost, when the claw is open, when the claw is closed, when the gantry/crane and/or claw is in motion, etc., as is well known in the art. The microprocessor includes an integral digital to analog converter, and provides an analog audio signal at pin 111. This audio signal is communicated to the non-inverting input of operational amplifier U13 (model LM358 or equivalent). U13 and its associated support circuitry (resistors and capacitors) comprise an active low-pass filter which filters and smoothes the analog audio signal. The audio signal next communicates via connector P2 with an audio potentiometer, which enables the user of the game to adjust sound volume levels. The volume-adjusted audio signal next enters power amplifier U14 (Philips model TDA8563AQ, or equivalent), where the signal is amplified before transmission to the speaker via leads SPKR- and SPKR+.

Inputs to Main Circuit

[0056] There are various input signals to the main circuit board from various sensors, switches, mechanical controllers, etc., of the invention.

[0057] The input signals enter the main board at various sections. Front door section **230** includes connector P9 (Figure 23) arranged to receive input signals JoyFront (joystick front), JoyRear (joystick rear), JoyRt (joystick right), JoyLt (joystick left), JoyBtn (joystick button), Coin1 (coin slot 1), Coin2 (coin slot 2), and DBV (dollar bill validator). The "joystick front" position is toward the player; the "joystick rear" position is away from the player. The "joystick right" position is toward the right of the player; the

"joystick left" position is toward the left of the player. It is assumed for this description that the player is facing the front of the game. As the joystick is moved, appropriate signals are sent to the board at P9. As coins are inserted into either of the two coin slots, appropriate signals are sent to the board at P9. When a dollar bill is validated, an appropriate signal is sent to the board at P9.

[0058] Also shown in Figure 23 is connector P3 for ticket acknowledgement. This signal indicates that redemption tickets are being dispensed by a ticket dispenser (some jurisdictions require the dispensing of tickets when a player fails to win a prize with the claw).

[0059] Also shown in Figure 23 is connector P2 for accounting and programming functions, as is well known in the art.

[0060] Other input signals enter circuit section **240** from the gantry (carriage) assembly at connector P1 as shown in Figure 38. Connector P1 receives input signals, HomeF/B (home front rear), HomeL/R (home left right), ClawUp (claw up), ClawDn (claw down). The Home input signals indicate when the crane assembly is in its "Home" position, and the Claw input signals indicate when the claw assembly has reached the top and bottom of its travel. An additional signal enters connector PX4 to indicate front limit (i.e., limiting movement of the gantry toward the player). Also shown in this figure is connector P7, operatively arranged to receive an optional door switch signal, which indicates the status of the front door of the game.

[0061] Connectors PX1 (Figure 35), PX2 (Figure 29) and PX3 (Figure 34) connect the main board to the up/down, left/right, and front/rear motors, respectively, of the invention. Input signals ErrorHR, ErrorHL, and ErrorP enter the board at PX1 from the up/down motor drive daughter controller board to indicate various errors on the controller board. Input signals ErrorHR, ErrorHL, and ErrorP enter the board at PX2 from the left/right motor drive daughter controller board to indicate various errors on the controller board. Input signals ErrorHR, ErrorHL, and ErrorP enter the board at PX3 from the

front/rear motor drive daughter controller board to indicate various errors on the controller board.

Output Signals

[0062] The connectors on the main board also include a plurality of output connections. As shown in Figure 33, circuit section **220** comprises connector P9. This connector includes outputs Speaker+ and Speaker- for the audio speaker connection. Connector P7, shown in Figure 36, is part of circuit section **250**, and includes provisions for connecting light outputs at LBlink and RBlink. Connector P3, shown in Figure 28, is part of circuit section **260**, and includes provisions for output signal TRUN which tells the ticket dispenser to operate.

[0063] Motor up/down drive connections are shown in Figure 35. Drive currents MotUp and MotDn leave connector P1 for the up/down motor as shown in Figure 35. In operation, the microprocessor sends control signals via connector PX1 to the motor daughter board, the circuit of which is shown in Figures 41 and 42. In turn, the daughter board sends appropriate drive currents back to the main board at PX1, and motor drive currents leave the main board at P1 to control the up/down motor.

[0064] Motor left/right drive connections are shown in Figure 29. Drive currents MotRight and MotLeft leave connector P1 for the up/down motor as shown in Figure 29. In operation, the microprocessor sends control signals via connector PX2 to the motor daughter board, the circuit of which is shown in Figures 41 and 42. In turn, the daughter board sends appropriate drive currents back to the main board at PX2, and motor drive currents leave the main board at P1 to control the left/right motor.

[0065] Motor front/rear drive connections are shown in Figure 34. Drive currents MotFront and MotRear leave connector P1 for the front/rear motor as shown in Figure 34. In operation, the microprocessor sends control signals via connector PX3 to the motor daughter board, the circuit of which is shown in Figures 41 and 42. In turn, the

daughter board sends appropriate drive currents back to the main board at PX3, and motor drive currents leave the main board at P1 to control the front/rear motor.

[0066] Circuit section **270** includes connector PX4, (shown in Figure 39). Connector PX4 includes two lockout output signal connections (labeled "Lockout") to energize lockout coils to prevent coins from being accepted in the coin slots. For example, in certain jurisdictions, such as New Jersey and California, it is not permitted to allow the machine to build up credits, and the coin slot mechanism must be deactivated until the current credit is used.

[0067] Also shown in Figure 39 is connector P8 (part of circuit section **270**) which includes two output signal connections, PCntr, which is a "plush" or "prize" counter to count the number of prizes awarded, and CCntr, which is a coin counter signal. For example, an owner/operator of the game can use these signals to determine how many coins were taken in and how many prizes were awarded.

[0068] Finally, output display signal connections are made at connector P6. The game includes LED displays to indicate the number of credits remaining, as well as a time counter which, in a preferred embodiment, counts down as the game is in progress.

Miscellaneous Circuit Elements

[0069] Circuit section **280** comprises circuit element U1, a reset circuit which functions to ensure that supply voltage to the processor is adequate; otherwise the processor is disabled. In a preferred embodiment, ceramic resonator Y1 provides a 25MHz clock signal to the microprocessor. Circuit section **250** (Shown in Figure 36) comprises transistors Q1 and Q2, operatively arranged to driver lights, which are optional in the game. Circuit section **290** comprises drive transistor U3 (Shown in Figure 31), operatively arranged to provide power to the claw (at 36V). Circuit section **260** (Shown in Figure 28) comprises diagnostic LEDs D10-D14, operatively arranged to provide diagnostic feedback to the operator.

Electrical Operation During Game Play

[0070] Adverting now to Figures 19a-21; which are flow diagrams of the amusement game; prior to start **111** of a game, the game can be programmed to maintain an "attract" mode. While in the attract mode, the gantry assembly, the crane assembly and the claw assembly maintain the "Home" position and the game emits sounds, or displays various lights in an effort to attract game players. Also, prior to the start of a game, the test mode **112** can be enabled to allow the game to conduct diagnostic tests of its mechanical and electronic components. As shown in Figure 19a, when the test mode is toggled, the game is instructed to run hardware tests **119** and review options settings. The game then resets the gantry, crane and claw assemblies to the "Home" position **114**. If a critical error is detected **115**, all game drives are turned off and an error code is displayed **116** on display 38. If no errors are detected, the reset scale command is sent to the scale. Where the test mode indicates that everything is in proper working order the gantry, crane, and claw assemblies remain in the "Home" position.

[0071] To commence a game, a player inserts money or tokens into the game in one of three ways. In a preferred embodiment, the money is inserted into either first coin slot, a second coin slot, or the dollar bill validator. All of these devices, as indicated above, send appropriate signals to the motherboard from the front door via connector P9 (at pins 6, 14 and 10, respectively). These coin/dollars signals are active low signals (which means the signals go from +5V to ground). This signal is communicated to the microprocessor, which detects insertion of a coin or credit, and initiates a "money insert" sound. Once the preprogrammed "cost of game" amount has been detected by the microprocessor (it make take a plurality of coins to reach this amount) **121**, the game is started. Once the game is activated the microprocessor sends appropriate signals to connector PX4 to turn off the lockout devices. If lockout coils are attached, they prevent any further coins from being inserted. This is required in certain jurisdictions.

[0072] At this point, the game starts to play background music, if preprogrammed to do so, and the gantry and crane centers itself in the "Home" position, generally indicated by reference number **123**. The music is stored in a digital format in the EPROMs, converted to analog signals in the microprocessor and output at pin 111 (AUDIO) to the audio amplifier (U13). In a preferred embodiment, the "centering" position of the gantry, crane and claw is shown in Figure 8, although this position is programmable. Centering is accomplished by left/right and translational movement of the gantry and crane, which motor control will become clear from the following description of circuit operation during game play.

[0073] During game play, the player moves the joystick in the general direction that she wishes the claw to move. The joystick is coupled to sensing switches that, in turn, send signals to the main board. The microprocessor interprets and processes these signals and sends appropriate control signals to control the up/down motor, left/right motor, and front/rear motor, respectively. To control the up/down motor, appropriate enabling and directional signals are sent from the microprocessor to connector PX1, which, in turn, sends appropriate up/down control signals to the up/down motor daughter control board. To control the left/right motor, appropriate enabling and directional signals are sent from the microprocessor to connector PX2, which, in turn, sends appropriate left and right control signals to the left/right motor daughter control board. To control the front/rear motor, appropriate enabling and directional signals are sent from the microprocessor to connector PX3, which, in turn, sends appropriate front and rear control signals to the front/rear motor daughter control board.

[0074] From the centered position shown in Figure 8 to the position shown in Figure 9, the joystick would be moved leftwardly and frontwardly, causing leftward and frontward movement of the gantry. Electronically, a "JoyLt" signal would be received at connector P9, that tells the microprocessor that the joystick has been moved leftwardly, and a "JoyFront" signal would be received at connector P9, that tells the microprocessor

that the joystick has been moved frontwardly. The microprocessor, in turn, sends appropriate enabling and directional signals to PX2, instructing left/right movement of the left/right motor. Similar "JoyRt" and "JoyRear" signals would be received at connector P9 to effect movement in the rightward and rearward directions, respectively. It should be appreciated that the player can move, at her option, in more than one direction (front-left, rear-left, front-right, rear-left) at a time, or may move the gantry in a first direction, and then a second direction, etc.

[0075] As shown in Figure 2, once the player has positioned the claw above a desired prize, she then presses pushbutton **35** on the joystick which, in turn, sends a signal JoyBtn to connector P9. This signal is processed by the microprocessor, which, in turn, sends appropriate enabling and directional signals to connector PX1, instructing the up/down motor (via its daughter board) to cause translational movement of the claw in the down direction, as shown in Figure 2. As the claw proceeds downwardly, the claw is in an open position. This downward movement of the claw continues, in a preferred embodiment, until the claw contacts a desired prize, or any obstacle (e.g., game platform), at which point a sensor, operatively arranged to sense slack (or degree of tautness) in a cable or string, which supports the claw, sends a ClawDn signal to connector P1, which signal passes through its filter network to become filtered signal CD. This signal is sent to pin 78 of U2. U2 then deasserts signal Down to stop the claw from moving down. Immediately after stopping the claw downward movement, the claw closes as shown in Figures 3 and 11. To close the claw, a signal CLAWC is sent from pin 34 of U2 to U3, which, in turns provides the necessary 36V signal to pin 14 (CLAW) of connector P1, closing the circuit to energize the coil in the claw, thereby closing the coil.

[0076] After a preprogrammed time (of approximately 1 second), the claw is programmed to travel in the upward direction. This is accomplished by the processor asserting the Up signal at pin 115, which transfers the appropriate signal to PX1, which transfers the appropriate signal to the up/down motor control daughter board to move the

claw upwardly (via appropriate signals at connector P1 for MotUp). The claw continues in an upward direction until signal ClawUp is asserted at pin 4 of P1, which is interpreted via the CU signal of the filter network by the microprocessor (pin 79), and then processed by the microprocessor to stop the upward movement.

[0077] At this point, depending on the position of the claw at the time of grabbing the prize, the microprocessor sends appropriate signals and output commands to position the crane and claw directly over the scale (Home position, as shown in Figure 3). The microprocessor "knows" the crane is in its Home position when a first signal is asserted at the HomeL/R pin of connector P1, which means it is Home (from a leftward/rightward perspective), and when a signal is asserted at the HomeF/R pin of connector P1, which means it is translationally Home (from a front/rear perspective). At this point, the CLAWC signal is de-asserted (after about a one second wait), removing power from the claw, causing the claw to open due to the spring and weight, thereby releasing any prize held in the claw onto the scale plate.

[0078] Once prizes/objects are placed on the scale plate, there is a brief time delay to allow the scale to stabilize. The processor then transmits a command to the scale circuitry to obtain the current weight of the prizes/objects. Commands are sent to the scale circuit via pin 59 of U2 through pin 1 of connector P12 (Shown in Figure 37). Replies from the scale circuit to the main processor are returned through pin 2 of P12 into pin 61 of U2. A digital packet of information pertaining to the weight of the prizes/objects is returned to the main processor. Based upon the weight information, the main processor then evaluates the weight and determines whether the weight of the prizes/objects falls within the "take win" range and transmits a command to the scale circuitry for positioning the needle indicator.

[0079] In a preferred embodiment, where the processor evaluates a weight which falls below the programmed "take win" range **31** (See Figure 3), play continues and additional prizes/objects may be added upon scale plate **21**. Where the processor evaluates a weight

above the programmed "take win" range, the player loses and a command is transmitted from the main processor to the scale processor to move the prize/object gate to the right and return prize/objects to the game platform, which ends game play (Shown in Figure 6). Where the processor evaluates a weight within the "take win" range, the player is allowed to continue play or take the prizes/objects. At this point, the main processor asserts pin 73 of U2 in Figure 36 (circuit section **250**), which turns on transistor Q1 enabling the range light display **33**. Moving the joystick while the weight remains within the "take win" range signals the processor of the player's intention of continuing play. Where a player chooses to take their win, depressing "take win" button **35** activates pin 33 (Shown in Figure 38) of U2, which commands the scale circuit to dispense the prizes/objects, which causes the prize/object fence to move to the left. After moving to the left or the right, the prize/object gate then returns to its centered position above the scale plate.

[0080] Operating options are stored in U4 (shown in Figure 37) and are communicated with the main processor via pins 94, 97, 98, and 101 of U2. These devices use the industry standard SPI method of communication for storing and retrieving non-volatile information.

Scale Board

[0081] Commands from the main processor arrive at pins 1 and 4 of connector P2 as shown in Figure 47, which are connected to the send and receive pins 17 and 18, respectively, of U1.

[0082] When the scale processor receives the "get weight" command from the main processor, it performs several processes to obtain the "weight" information. Scale circuit section **290** is shown in Figure 46, which illustrates the load cell connections to the A/D converter (U2). The weight of prizes/objects placed on scale plate **21**, which is connected to load cell **92** (as shown in Figure 22), presents a unique voltage at pins 3 and 4 of connector P1. The very small changes in voltage are amplified and converted into a stream of digital information by U2. Commands are sent using pins 2, 3, 11, 12 and 16

from U1 to U2 to obtain a digital weight representation. This information is then transferred to U1 via pins 14, 15 and 16 by means of digital data packets and stored within scale processor U1. This information is relayed back to the main processor, finishing the "get weight" command.

[0083] The "position needle" command from the main processor causes the scale processor to position the needle indicator. As shown in Figure 47, pin 2 of connector P3, a variable duty cycle signal is presented by pin 13 of U1.

[0084] We now describe circuit sections **300** and **310** shown in Figures 50 and 48, respectively. The "return prizes/objects" command from the main processor causes the prize/object gate to move to the right. The scale processor U1 asserts the MR command, at pin 28, which turns on transistor Q4 and turns off transistor Q2. U1 also de-asserts the ML command, at pin 27, which turns on transistor Q1 and turns off transistor Q3 of the H-bridge. This provides positive voltage at pin 1 of connector P3 and ground at pin 2 of connector P3, thereby enabling the motor to move the prize/object gate to the right. The prize/object motor continues operation until the right limit switch input at pin 3 at connector P5 is activated. When the input switch is activated, the processor de-asserts the MR command. The ML command is asserted to drive transistor Q3 and turn off Q1, which enables the prize/object motor to move the prize/object gate to the left until the center "home" switch at pin 2 of connector P5 is activated. The ML command is de-asserted thereby stopping the prize/object gate motor at the center position.

[0085] The "dispense prize" command is similar in function to the "return prize" command; the ML command is asserted and MR de-asserted, which causes the prize/object motor to move the prize/object gate to the left until it activates the left limit switch at pin 1 of connector P5. ML is then de-asserted and MR asserted causing the prize/object gate to move to the right until the center "home" switch is activated and MR de-asserted.

[0086] Figure 49 is an illustration of the power supply circuit showing capacitors C22, C24, C25, C26, and C27, and VR2, which comprise the preferred embodiment of the present invention, as well as the connector P7 which turns on range light display 33.

Displays

[0087] In a preferred embodiment, the game includes two displays, both dual LED displays. One display is used to display credits, and the other is used to display time remaining in the game. In a preferred embodiment, the game is preprogrammed for a game time of 20 seconds, but this is of course programmable. The LED display drive circuits are shown in Figures 43 and 44. Operation of the drive circuit is well known in the art.

Driver Board

[0088] The game includes three motors: a front/rear motor, an up/down motor for the claw, and a left/right motor. There are, therefore, three controller daughter boards for controlling these motors. The controller circuits for the three translational (front/rear, left/right and up/down) motors are identical, and shown in Figures 41 and 42. The circuit includes three inputs MB1L, MB1R and MB1P. MB1P is the enable line, and the remaining two inputs are used to signal movement in a first (up, forward, left) or second (down, rear, right) direction. The drive circuit is a standard H bridge configuration. When the enable signal is low, transistors Q1 and Q2 are turned off, so the motor cannot be energized. When the enable signal is high, transistors Q1 and Q2 are enabled, so the motor can be energized. The polarity and direction of rotation of the motor is, of course, determined by the control signals MB1L and MB1R. With the enable signal high, a high signal at MB1L results in a high output signal from pin 11 of AND gate U4, thereby turning on Q1 to provide power to the motor at MB101. With the enable signal high, a high signal at MB1R results in a high output signal from pin 8 of AND gate U4, thereby turning on Q2 to provide power to the motor at MB102. The H bridge thus functions to

provide power to, and, depending on the received input signals, change the polarity of the applied voltage to the motor, to change the direction of rotation.

[0089] Thus, it is seen that the objects of the present invention are efficiently obtained, although it should be readily apparent to those having ordinary skill in the art that changes and modifications can be made to the invention without departing from the spirit and scope of the invention as claimed. It should especially be appreciated that the subject game is programmable, both by the manufacturer and by the user. Hence, it should be appreciated that variations of the game may be made, used and sold, and yet be within the spirit and scope of the claims, since the programmability of the game inherently invites such variations. For example, it should be readily apparent that the predetermined weight range conditions under which a prize is "won" or "lost" is programmable. It should also be readily apparent that, although in a preferred embodiment, the criteria used for determination of a prize award is based on weight, the spirit and scope of the invention is intended to include other prize characteristics, such as, but not limited to, mass, shape, size, color, magnetic characteristics, and the like.